United States
CONSUMER PRODUCT SAFETY COMMISSION
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MEMORANDUM

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Through: Mary Ann Danello, Associate Executive Director
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From: Kimberly Long, EHHA

Subject: Non-Fire-Related Carbon Monoxide Deaths and Injuries Associated with the Use of Household Appliances

Summary

This memorandum provides estimates of non-fire-related carbon monoxide (CO) deaths and injuries[1] associated with the use of household appliances for the latest years for which data are available. (These estimates do not include deaths and injuries from carbon monoxide poisoning associated with auto exhaust.) There were an estimated 214 CO deaths in 1993 and an estimated 5,900 CO injuries in 1995. Most of these deaths and injuries occurred during the winter months and mainly involved heating systems, such as furnaces and heaters. The estimated number of CO deaths has decreased by 34 percent since 1983. The largest decrease by type of fuel was a 41 percent decrease in the estimated number of deaths associated with gas-fueled appliances.

Estimated Deaths

During 1993, there were an estimated 214 non-fire-related CO deaths. Figure 1 and Table 1 show the distribution of the deaths by various appliances and fuel types involved. Over two-thirds of the deaths involved gas-fueled appliances, including heaters[2], furnaces, water heaters, ranges and ovens, gas grills, and propane lanterns. Solid-fueled appliances, including charcoal grills and wood and coal heating systems (heaters, furnaces, and fireplaces), accounted for 20 percent of the deaths. Liquid-fueled appliances, including kerosene heating systems and

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[1]The death estimates are based on data from the National Center for Health Statistics (NCHS) and the Commission's Death Certificate File. The CO injury incident estimates are based on data from the National Electronic Injury Surveillance System (NEISS), which provides incident data from hospital emergency rooms.

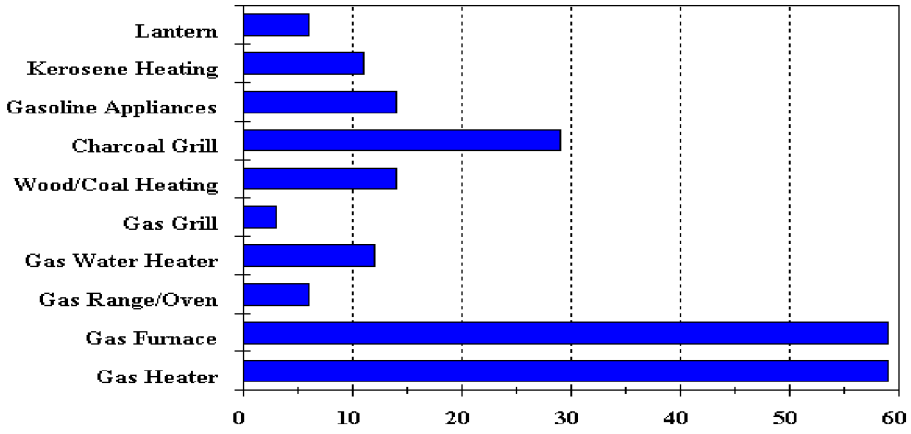
[2]For additional information, see CPSC memorandum "Non-Fire-Related Carbon Monoxide Deaths and Injury Estimates Associated with Camping Heaters" dated March 1, 1996 from Kimberly Long to Don Switzer.

appliances powered by gasoline, accounted for 12 percent of the deaths.

Children under 15 years of age accounted for 10 percent of the deaths, and the elderly, persons over 65, accounted for 20 percent. The risk of death per million U.S. population for children under 15 (0.25) was lower than that of the elderly (0.82) and the overall risk of death for all age groups (0.53). Most of the deaths (84%) occurred from October through March, the primary months when heating appliances are used. (See Appendix 1.) Most of the deaths (82%) occurred in the home, and the remaining incidents occurred in sport or recreational areas, streets and/or highways, and industrial sites. The deaths occurring in streets and/or highways involved victims spending the night in a van or car. Typically, the victims were burning charcoal to keep warm. The deaths occurring at industrial sites involved victims who were staying at the work site overnight, using portable heaters and propane generators. Eighty-eight percent of the victims were white, 11 percent were black, and the remaining were of other racial backgrounds. Seventy percent of these victims were males. Appendix 2 presents the estimated number of deaths between 1983 and 1993.

Figure 1

1993 Carbon Monoxide Deaths by Type of Appliance Involved



Sources: U.S. Consumer Product Safety Commission / EHHA
National Center for Health Statistics and CPSC Death Certificate File, 1993

Table 1
National Estimates of Non-Fire-Related Carbon Monoxide Deaths (1993) and Injuries (1995) Associated with the Use of Residential Appliances

Appliances by Fuel Type	Deaths		Injuries	
	Number	Percent	Number	Percent
Total	**214**	**100%**	**5,900**	**100%**
Gas	**146**	**68%**	**4,100**	**69%**
Space Heater	59	28%	1,600	27%
Furnace	59	28%	1,800	31%
Range / Oven	6	3%	400	7%
Lantern	6	3%	0	0%
Water Heater	12	6%	100	2%
Other	3	1%	200	3%
Solid	**43**	**20%**	**1,300**	**22%**
Charcoal Grill	29	14%	100	2%
Wood/Coal Heating	14	7%	1,200	20%
Liquid	**25**	**12%**	**500**	**8%**
Gasoline Appliances	14	7%	100	2%
Kerosene Heating	11	5%	100	2%
Oil Heating	0	0%	300	5%

Detail may not add to total due to rounding. The asterisk (*) represents that the estimate is less than 100.

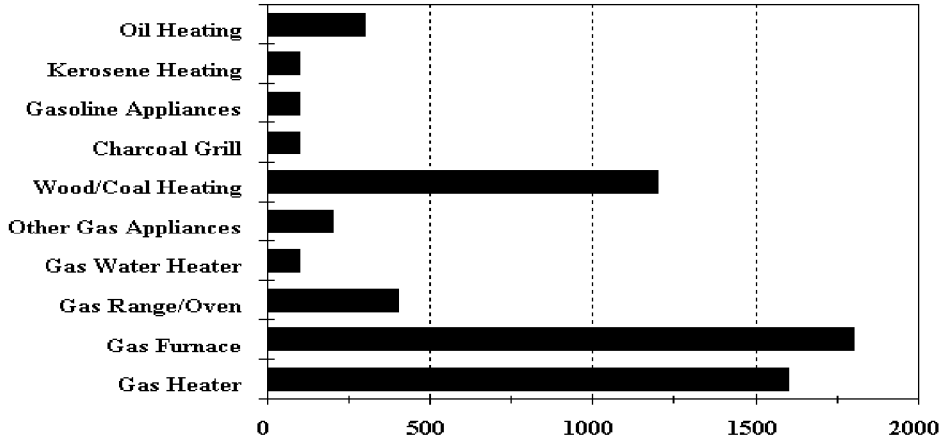
Sources: U.S. Consumer Product Safety Commission / EHHA
National Center for Health Statistics and CPSC Death Certificate File, 1993
National Electronic Injury Surveillance System, 1995

Estimated Injuries

During 1995, an estimated 5,900 individuals were treated in hospital emergency rooms for non-fire-related CO poisoning associated with the use of household appliances. Table 1 and Figure 2 show the distribution of these injuries by the kind of product involved. Gas-fueled appliances, primarily furnaces and heaters, accounted for 69 percent of all injuries. Solid-fueled appliances, including fireplaces, chimneys, wood stoves and charcoal grills, accounted for 22 percent of the injuries. Liquid-fueled appliances, including kerosene and oil heating systems and gasoline-powered appliances (generators, saws, and garden tractors), accounted for 8 percent.

Estimates of nonfatal injuries from CO exposure are difficult to determine. Many victims do not seek medical attention or may be misdiagnosed, since symptoms can be similar to those associated with colds and the flu. Additionally, some CO injuries treated in hospital emergency rooms report only a CO detector alarming and no mention of a specific product involved in the incident. Therefore, the estimated number of injuries is considered a minimum estimate. The estimates have not been adjusted for possible misdiagnosis.

Figure 2
1995 Carbon Monoxide Injuries
by Type of Appliance Involved



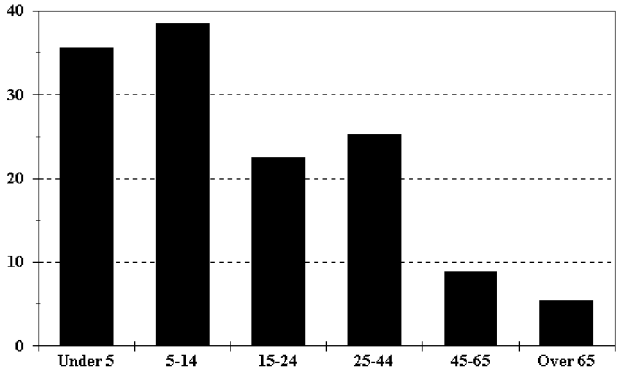
Sources: U.S. Consumer Product Safety Commission / EHHA
National Electronic Injury Surveillance System, 1995

Table 2 and Figure 3 present the 1995 estimated injury risk per million U.S. population for all ages. For every one million persons approximately 22 persons were injured by CO poisoning. The injury rate for children between 5 and 14 years of age was about 39 per million, the highest of all age groups. Children under 5 years of age had an injury risk of 36 per million. Persons over 65 years of age had an injury rate of 5 persons per million population. Appendix 1 shows that most of the injuries (91%) occurred from October through March, the primary months when heating appliances are used.

Table 2
Risk of Non-Fatal Carbon Monoxide Poisoning by Age Group

Age of Victim	Risk per million U.S. population
All Ages	**22**
Under 5 years	36
5 - 14 years	39
15 - 24 years	22
25 - 44 years	25
45 - 64 years	9
Over 65 years	5

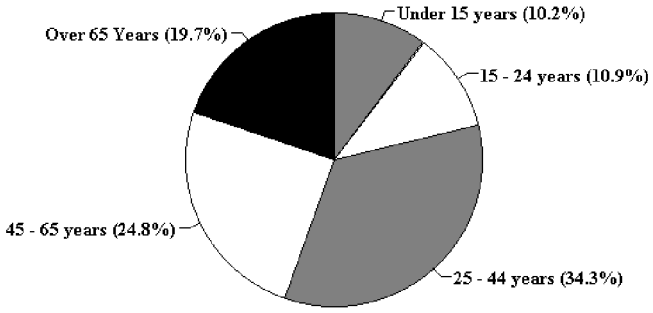
Figure 3
1995 Carbon Monoxide Injuries
Risk of Injury by Age of Victim



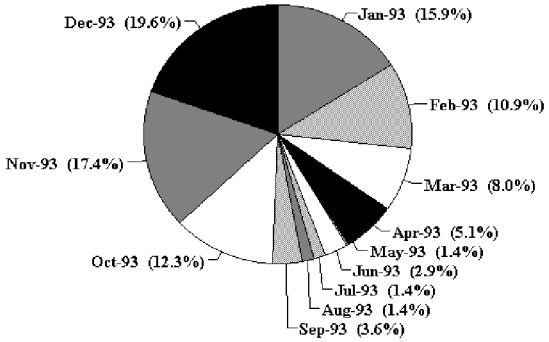
Source: U.S. Consumer Product Safety Commission / EHHA
National Electronic Injury Surveillance System, 1995

Appendix 1

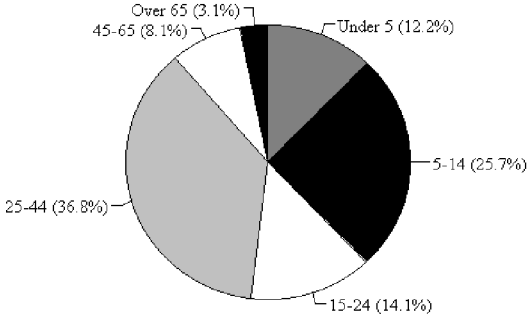
1993 Carbon Monoxide Deaths by Age of Victim



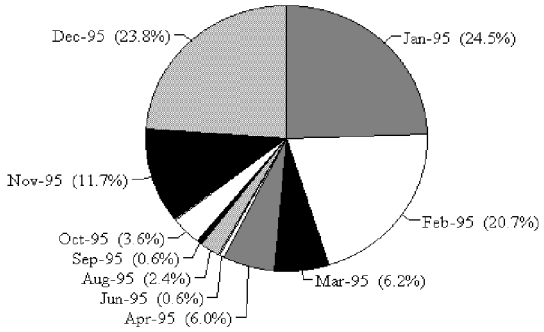
1993 Carbon Monoxide Deaths by Month of Death



1995 Carbon Monoxide Injuries by Age of Victim



1995 Carbon Monoxide Injuries by Month of Injury



Source: U.S. Consumer Product Safety Commission / EHHA
National Center for Health Statistics and CPSC Death Certificate File, 1993
National Electronic Injury Surveillance System, 1995

Appendix 2
National Estimates of Non-Fire-Related Carbon Monoxide Deaths for Various Residential Appliances 1983-1993

Appliances by Fuel Type	Number of Deaths by Year										
	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983
Total	**214**	**212**	**252**	**245**	**296**	**238**	**232**	**240**	**284**	**275**	**323**
Gas Fueled	**146**	**143**	**162**	**183**	**220**	**190**	**181**	**198**	**226**	**204**	**249**
Heater*	59	55	69	86	130	84	89	103	115	104	135
Furnace	59	48	52	55	56	83	54	57	57	47	55
Range/Oven	6	19	23	25	22	5	23	23	31	28	24
Water Heater	12	5	10	7	6	13	3	7	20	13	21
Lantern	6	11	6	4	4	5	12	2	3	12	11
Other	3	5	2	6	2	-	-	3	3	-	3
Solid Fueled	**43**	**44**	**61**	**38**	**32**	**34**	**31**	**23**	**52**	**62**	**53**
Charcoal Grill	29	38	36	20	30	29	20	21	49	38	39
Wood/Coal Heating	14	6	25	18	2	5	11	2	3	24	14
Liquid Fueled	**25**	**25**	**29**	**24**	**44**	**14**	**20**	**19**	**6**	**9**	**21**
Oil Heating	0	4	4	6	9	3	12	14	-	6	9
Kerosene Heating	11	8	23	7	20	11	5	5	6	3	12
Gasoline Appliance	14	13	2	11	15	-	3	-	-	-	-

Note: Detail may not add to total due to rounding.

* For additional information, see CPSC memorandum "Non-Fire-Related Carbon Monoxide Deaths and Injury Estimates Associated with Camping Heaters dated March 1, 1996 from Kimberly Long to Don Switzer.

Source: U.S. Consumer Product Safety Commission / EHHA
National Center for Health Statistics Mortality Data and CPSC Death Certificate File

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